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Personal Protective Equipment (PPE)

REVISION

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1. PURPOSE

- 1.1 To provide minimum guidelines for the use of Personal Protective Equipment (PPE) within specified hazard areas and/or during designated procedures, and to adequately protect persons from potential hazards such as chemical, physical, or mechanical.
- 1.2 This Personal Protective Equipment Program provides procedures to be followed in accordance with the Occupational Safety and Health Administration's (OSHA) Part 29 Code of Federal Regulations (CFR) 1910.132 to 1910.140.

2. SCOPE

- 2.1 This program applies to NY CREATES employees, tenants, and contractors who may be performing an activity or operation at the Albany Nanotech Complex (ANC) that requires the use of Personal Protective Equipment (PPE). Tenant employees, contractors, and sub-contractors may comply with their own organization's program provided that it meets and/or exceeds the minimum requirements set forth in OSHA Part 29 Code of Federal Regulations (CFR) 1910.132 to 1910.140.
- 2.2 This specification refers to the following types of PPE for protection of: eyes, face, head, feet, hands, body and for protection from falls.
- 2.3 Information regarding respiratory protection is located in the Respiratory Protection Program, **EHS-00015**.

3. RESPONSIBILITY

- 3.1 NY CREATES **must** make PPE conveniently available to all, at no cost.
- 3.2 **Supervisors, Managers, Equipment Engineers and Primary Investigators (PIs)**
 - 3.2.1 Each individual's supervisor **must** be responsible for assuring the required equipment is used and training is completed.
 - 3.2.2 Department Supervisors, Managers, Equipment Engineers and/or Primary Investigators are responsible for performing workplace hazard assessments. Hazard assessments must be completed for jobs and/or tasks that are performed by personnel in their departments/area to determine if hazards are present, or are likely to be present, which necessitate the use of PPE. The Workplace Hazard Assessment and PPE Selection form (**EHS-00010-F1**) **must** be used to perform a workplace hazard assessment or equivalent hazard assessment forms may be used.

- 3.2.3 The Manager and/or Supervisor **must** repeat the workplace hazard assessment whenever changes in the work area or in the types of PPE to be used render prior assessment obsolete.
- 3.2.4 The Manager and/or Supervisor will be responsible for making sure that employees receive and understand the various components of PPE training as is appropriate for their job prior to being allowed to perform work requiring the use of PPE.
- 3.2.5 If the Supervisor has reason to believe that any employee who has already been trained does not have the understanding and skill required, the supervisor **must** make arrangements to retrain that individual. Circumstances where retraining is required include, but are not limited to:
- Changes in the work area render prior training obsolete, or
 - Changes in the types of PPE to be used render previous training obsolete, or
 - Inadequacies in an employee's knowledge or use of assigned PPE indicate that the individual has not retained the required understanding or skill.
- 3.2.6 Supervisors are responsible for enforcing the use of and proper care of PPE for all employees within their department.
- 3.3 **EHS Department**
- 3.3.1 The EHS Department **must** develop, administer and provide training (through Cleanroom and Laboratory Safety) regarding the PPE program at the **ANC**. The EHS Department **must** provide guidance to Supervisors and Managers.
- 3.4 **Employees**
- 3.4.1 Review Site's Cleanroom and/or Laboratory Safety Training, where most PPE training is covered.
- 3.4.2 **Must** be responsible for wearing PPE as indicated by identified hazards.
- 3.4.3 **Must** complete PPE training and make his/her Supervisor aware if additional training is needed; such as for specific PPE instructions or awareness, as well as Respiratory Protection (**EHS-00015**), if required.
- 3.4.4 **Must** inspect, maintain, and clean PPE on an assigned basis, and will report/replace deficiencies.
- 3.4.5 **Must** not use damaged or defective PPE.

4. ASSOCIATED DOCUMENTS

- 4.1 EHS-00010-F1 Workplace Hazard Assessment and PPE Selection Form.
- 4.2 **Appendix A** – Workplace Hazard Assessment and PPE Selection Form (EHS-00010-F1) Instruction
- 4.3 **Appendix B** – Guidelines for Hazard Assessment and Personal Protective Equipment (PPE) Selection for Areas/Operations/Activities
- 4.4 EHS-00015 –Respiratory Protection Program

5. PERSONAL PROTECTIVE EQUIPMENT (PPE)

5.1 General

- 5.1.1 PPE shall provide adequate protection against the particular hazards for which it was designed and **must** meet applicable ANSI Standards.
- 5.1.2 PPE **must** be durable, fit snugly, and not impede upon or duly interfere with the movements of the wearer.
- 5.1.3 PPE **must** properly fit each affected individual.
- 5.1.4 PPE **must** be stored and maintained in a clean, dry, sanitary manner and kept in good repair.
- 5.1.5 At no time **must** any person be allowed to enter a work area or perform an assigned task without the required PPE.
- 5.1.6 All PPE **must** be inspected prior to use. Defective and/or damaged equipment **must** not be used and **must** be replaced with new, undamaged PPE.
- 5.1.7 Contaminated protective clothing **must** be thoroughly washed and wiped dry prior to removal.
- 5.1.8 PPE **must** not be altered or changed in any way and must be worn in the prescribed manner.
- 5.2 Designated areas requiring the use of PPE should be appropriately posted.
- 5.3 PPE cabinets are located throughout the facility that contain gloves, aprons, and face shields, etc., for use.

PPE Cabinet Location	MAPA Trionic Gloves	Nitrile Gloves	Glove Liners	Sleeve Apron	Coat Apron	Goggles	Face Shield
*CESTM – 2 nd floor hall	X	X		X		X	X
*CESTM – 1 st floor hall	X	X	X				
*NFE 4 th floor hall	X	X		X		X	X
HPM Corridor	X	X		X	X		X
NFC 4 th floor – outside chemical dispense rooms	X	X		X	X		X
NFE 2 nd floor hall	X	X		X	X	X	X
CMP Waste Room NFS/NFSX	X	X		X	X		X
NFS/NFSX Cleanroom	X	X		X	X		X
CUB	X	X		X	X		X
NFX Subfab	X	X		X	X		X
NFX- 300mm, 450mm, Air Liquide areas	X	X		X	X		X
NFX 2 nd floor- outside air chase, 450mm cleanroom by loading dock, office by loading dock	X	X		X	X		X
NFC FAB- LAM	X	X		X	X		X
Link between NFN & NFC FAB	X	X		X	X		X
NFN - 2	X	X		X	X		X
NFN – AMAT	X	X		X	X		X
NFN Subfab – FOUP storage area	X	X		X	X		X
NFN Subfab – Air Liquide storage area	X	X		X	X		X

*Maintained by Academic Engineering Support Group for use by UAlbany Staff and Students. All other cabinets are maintained by Site Services.

6. EYE AND FACE PROTECTION

6.1 Employees **must** use appropriate eye and/or face protection where there is the possibility for eye or face injuries from the following potential hazards, including but not limited to:

- ✓ flying particles,
- ✓ molten metal,
- ✓ liquid chemicals,
- ✓ acids or caustic liquids,
- ✓ chemical gases or vapors, or
- ✓ potential light radiation.

- 6.2 Eye protection in the form of safety glasses is required to be worn while working in laboratories, chemical storage/use (HPM) areas, and/or UPW/WWT areas.
- 6.3 Although safety glasses should always be worn in the areas listed in Section 6.2, the following tasks are considered exempt from the safety glasses requirement. The intention of this exemption is to permit those that are performing such tasks to temporarily allow them to remove their safety glasses:
- Research or teaching labs that involve computers or the use of microscope operations.
- IMPORTANT: Safety glasses are required for any of the aforementioned exempt tasks if corrosive, toxic, or infectious materials will be used.**
- 6.4 Goggles or face shields **must be** worn over primary eye protection (safety glasses or goggles if there is a possibility of splashing, spraying, or misting of hazardous corrosive chemicals.
- 6.5 Special purpose eye protection is required if a class 3b or 4 laser is in use or maintenance is being performed on such laser. Eye protection is required when receiving, transporting, or installing compressed gases.
- 6.6 Activities where there is the potential for eye injury due to flying particles, including but not limited to:
- Machining, grinding, drilling, cutting, soldering, welding
 - Facilities maintenance activities
 - Groundskeeping **or lawn activities** and
 - Construction activities.
- 6.7 Additionally, eye protection must be worn while working where dust and/or particles are disturbed and may be a hazard.
- 6.8 Safety glasses should have side shields permanently affixed to their frames. Detachable side protectors (clip on or slide on side shields) which meet the ANSI requirements are acceptable.
- 6.9 Individuals who wear prescription lenses while engaged in operations that involve eye hazards **must** wear eye protection that incorporates the prescription in its design or **must** wear eye protection that can be worn over their prescription lenses.

- 6.9.1 Prescription safety eyewear **must** be provided through the EHS Department to NY CREATES **employees** who need corrective lenses and are required to wear safety glasses. The EHS Department must approve the purchase of subsidized prescription safety glasses.
- 6.9.2 To obtain prescription safety eyewear, the individual whose job requires safety glasses **should** request a voucher for prescription safety glasses from sunypolyehs@sunypoly.edu.
- 6.9.3 Non-prescription safety glasses **must** be provided for employees requiring their use through Supervision/Departments, EHS, or Cleanroom Staff.
- 6.10 When face shields are required, safety glasses or goggles must be worn under the face shield.
- 6.11 Each affected individual **must** use equipment with filter lenses that have a shade number appropriate for the work being performed for protection from harmful light radiation. See OSHA 1910.133(a)(5) Personal Protective Equipment and consult with EHS for guidance.

7. RESPIRATORY PROTECTION

Please see the Respiratory Protection Program **EHS-00015** for further information regarding the use of respiratory protection at the [ANC](#).

8. HEAD PROTECTION

- 8.1 Individuals **must** wear head protection when working in areas where there is the potential for injury to the head from falling objects.
- 8.2 A protective helmet designed to reduce electrical shock hazard must be worn in areas where an individual is working near exposed electrical conductors which could come into contact with the head.
- 8.3 In areas where there is the potential for nuisance bumps of the head, bump caps may be worn, if preferred. Bump caps **must** not be used in areas and situations outlined in Section 8.1.

9. FOOT PROTECTION

9.1 Individuals **must** wear protective footwear when working in areas where there is danger of foot injuries due to falling and rolling objects or objects piercing the sole and where such individuals' feet are exposed to electrical hazards. The footwear required **will** depend on the nature of the work being performed by the individual, the material that is being handled by the individual, and/or the area in which the individual works. NY CREATES' **employees** who are required to wear foot protection must contact sunypolyehs@sunypoly.edu to request a voucher for safety shoes.

IMPORTANT: Foot protection **must** meet or exceed the ASTM standard for protective footwear.

9.2 Safety footwear with impact protection are required for carrying or handling materials over 50 pounds such as packages, objects, parts or heavy tools, gas and chemical handling, and for other activities where objects might fall onto the feet.

9.3 Safety footwear with puncture protection are required where sharp objects such as nails, wire, tacks, screws, large staples, could be stepped on by individuals causing a foot injury.

9.4 General Cleanroom and Laboratory Areas

9.4.1 Individuals working in cleanroom and laboratory areas **must** wear footwear conforming to the following requirements:

- Shoes must have closed heels and toes with the toes completely covered; sandals, crocs, flip flops, and similar types of footwear are NOT permitted.
- Shoes must have heels constructed of rubber or similar non-skid material.
- Heel height must not exceed two inches (2") from the back of the heel, and have a base of at least one-half inch (1/2").

9.5 Chemical Areas

9.5.1 In addition to the requirements for footwear in general cleanroom and laboratory areas, individuals working in areas where chemicals are used, or in areas where wet conditions may exist, **must** wear footwear that conforms to the following:

- Shoes must have a separate sole constructed of a non-porous, impervious material. Soft leather moccasins, sandals, or ballerina-type slippers are NOT permitted.

9.6 Chemical and Gas Cylinder Handling

- 9.6.1 In addition to the requirements listed for both general production and chemical areas, individuals required to handle chemicals (e.g., drums, boxes, bottles) and/or compressed gas cylinders **must** wear safety shoe footwear.
- 9.6.2 Individuals working in machining operations, facilities maintenance, shipping and receiving, chemical handling, gas cylinder handling, and any other area designated by EHS as having high potential for foot injury, must wear approved safety shoes.
- 9.6.3 ASTM approved safety shoes/boots **must** be provided through EHS Department to **NY CREATES employees** who are required to wear safety shoes / boots.

10. HAND PROTECTION

- 10.1 Employees must wear appropriate hand protection when an individual's hands are exposed to hazards such as possible skin absorption of harmful substances, cuts or lacerations, abrasions, punctures, chemical or thermal burns, and extreme temperatures. Glove selection **must** be **determined and** relative to the task, conditions, duration of use, and potential hazards. ([EHS-00010-F1 Workplace Hazard Assessment and PPE Selection Form](#))
- 10.2 When working with chemicals, protective gloves suitable for protection against chemicals must be worn.
- 10.3 For work involving the handling of hot parts or contact with heated surfaces, heat resistant gloves **must** be worn. These gloves **are not to** be constructed of asbestos.
- 10.4 For work involving the handling of cryogenic liquids and gases and their associated piping, cryogenic-rated insulated gloves **must** be worn.
- 10.5 Cut resistant gloves **must** be worn when hand protection during material handling is necessary or when a cut is expected unless manufacturer's guidelines state otherwise while using a designated piece of cutting equipment.
- 10.6 Protective gloves **must** meet the minimum requirements established by the manufacturer.
- 10.7 Protective gloves **must** be made available to employees requiring their use.
- 10.8 Finger cots shall not be substituted for gloves as protection against chemical contact.

- 10.9 Chemical-resistant protective gloves must be inspected and tested by the wearer for defects before use. This inspection can be done by visualization or by partially inflating the glove with air and placing the glove close to the face while feeling and inspecting for air loss to identify a defective glove. If a loss of air is detected, the glove **must** be discarded.
- 10.10 When working with liquids, the tops of the protective gloves should be turned down about one inch to form a cuff, which will prevent the liquid from running down the glove and inside to the hand and arm.
- 10.11 Jewelry, such as rings, should not be worn since they may puncture or tear the glove.
- 10.12 Fingernails should be trimmed to a reasonable length for the same reason.
- 10.13 Chemical-protective gloves **must** not be shared between individuals and must be changed whenever there is a question of the integrity of the gloves, or whenever it appears that the gloves are wet on the inside.
- 10.14 Gloves must always be removed before touching equipment or station controls, etc. Contaminated gloves need to be discarded in the appropriate waste container before exiting the lab.

11. BODY PROTECTION

- 11.1 Body protection in the form of chemical-resistant aprons, Tyvek suits, or laboratory coats may be required when working with chemicals. To determine if body protection is required, a hazard assessment must be performed. Some tasks recommended to require body protection are outlined in Appendix B. ([EHS-00010-F1 – Workplace Hazard Assessment and PPE Selection Form](#))
- 11.2 Body protection is always required when working with chemicals having a health rating of 3 or higher using the NFPA 704 rating system, when mixing chemicals, and when there is potential for splashing or misting of chemicals.

12. CHEMICAL-RESISTANT APRONS MUST BE STORED IN PPE CABINETS AND AVAILABLE TO INDIVIDUALS REQUIRING THEIR USE. CLEANING AND MAINTENANCE

- 12.1 All PPE must be properly cleaned before use and maintained.
- 12.2 If PPE is found to be defective or damaged, it **must** NOT be used and be replaced immediately.

13. TRAINING

13.1 The Supervisor / Department Manager or Primary Investigators must ensure that those individuals who are required to use PPE are trained to know at least the following:

- When PPE is necessary;
- What PPE is necessary;
- How to properly don, doff, adjust, and wear PPE;
- The limitations of the PPE;
- And how to properly care, maintain, and dispose of the PPE.

13.2 Before being allowed to perform work requiring the use of PPE, the individual must demonstrate an understanding of the concepts described in Section 13.1.1.

13.3 If changes in the workplace or changes in the type of PPE to be used occur that render previous training to be obsolete, the individual must be re-trained by their supervisor/department manager.

14. RECORDS

Copies of hazard assessments and PPE training records **must** be kept on file by the Manager or Supervisor.

15. APPENDICES

15.1 **Appendix A** – Workplace Hazard Assessment and PPE Selection Form (EHS-00010-F1) Instruction

15.2 **Appendix B** – Guidelines for Hazard Assessment and Personal Protective Equipment (PPE) Selection for Areas/Operations/Activities

APPENDIX A
WORKPLACE HAZARD ASSESSMENT AND PPE SELECTION FORM
(EHS-00010-F1) INSTRUCTION

The form is designed to:

- Identify and document hazards in the workplace area
- Identify the PPE required to minimize exposure, and
- Comply with OSHA requirements.
- Document the required completion of site-specific PPE training.

The Supervisor may assign a designee to perform or assist in the above duties but must ensure they are carried out.

In order to assess the need for PPE, a walk-through survey must be conducted to identify and evaluate hazards present in the workplace area and/or job function(s).

The **workplace** is defined as, but is not limited to,

- ✓ areas and/or job functions/tasks involving cleanrooms,
- ✓ site services,
- ✓ facilities operations,
- ✓ materials distribution,
- ✓ laboratories, and
- ✓ laboratory and engineering support services.

Multiple forms may be used, as needed, to include all workplace areas and/or job functions/tasks within a Department and/or Laboratory.

It is suggested that prior to completing them, employees review the documents with Supervision to ensure complete understanding. Once completed, signed, and dated, communicate the completed Workplace Hazard Assessment and PPE Selection form requirements with personnel and store the form either electronically or as a hard copy in a location easily accessible to personnel. Additionally, they can be supplied with a Work Area Permit.

The Workplace Hazard Assessment forms must be updated and reviewed when new hazards are introduced into the workplace area or whenever a piece of equipment, source, or process change warrants the use of new PPE.

APPENDIX B

GUIDELINES FOR HAZARD ASSESSMENT AND PERSONAL PROTECTIVE EQUIPMENT (PPE)
SELECTION FOR AREAS/OPERATIONS/ACTIVITIES

PERSONAL PROTECTIVE EQUIPMENT (PPE) GUIDELINES FOR SELECTION AREAS/OPERATION ACTIVITIES	HEAD	EAR	GLOVES			APPAREL		SHOES	EYE/FACE			RESPIRATOR			
	HARD HATS	PLUGS/MUFFS	CHEMICAL RESISTANT	TEAR RESISTANT	FLAME/HEAT RETARDANT	COLD RESISTANT	APRONS/SLEEVE APRON/LAB COAT	FLAME RETARDANT COVERALL	STEEL TOE SAFETY SHOES	SAFETY GLASSES	FACESHIELD	FLAME RETARDANT HOOD	N95 Filtering Facepiece	AIR PURIFYING CARTRIDGE (Full facepiece)	SUPPLIED AIR
Areas/operations/activities where there is a potential for eye injury due to liquid chemicals, gases, or their vapors, including but not limited to: Laboratories, UPW/WWT plants, cleanrooms, Chemical/Gas Storage Rooms: HPM rooms, HPM Building, Hazardous Waste Storage Building, and CUB where determined by assessments.										X					
Activities where there is a potential for eye injury due to liquid chemicals, gases, or their vapors, including but not limited to: Chemical users and waste generators/handlers, janitorial staff.										X					
Areas/operations/activities where there is the potential for eye injury due to flying particles, including but not limited to: Machining, Grinding, Drilling, Cutting, Soldering, Welding, Facilities Maintenance Activities, Grounds keeping Activities, contractor and sub-contractor activities.										X					
Areas/operations/activities identified as potential risk for hearing loss including, but not limited to: CUB Bldg., D.I. Water Room, wastewater treatment plants, Boiler rooms, Process Support rooms, Chiller rooms, Scrubber rooms, Grounds Keeping Activities and while operating the emergency generators. See Hearing Conservation Program for a complete listing of such areas.		X													

PERSONAL PROTECTIVE EQUIPMENT (PPE) GUIDELINES FOR SELECTION AREAS/OPERATION ACTIVITIES	HEAD	EAR	GLOVES			APPAREL		SHOES	EYE/FACE			RESPIRATOR			
	HARD HATS	PLUGS/MUFFS	CHEMICAL RESISTANT	TEAR RESISTANT	FLAME/HEAT RETARDANT	COLD RESISTANT	APRONS/SLEEVE APRON/LAB COAT	FLAME RETARDANT COVERALL	STEEL TOE SAFETY SHOES	SAFETY GLASSES	FACESHIELD	FLAME RETARDANT HOOD	N95 Filtering Facepiece	AIR PURIFYING CARTRIDGE (Full facepiece)	SUPPLIED AIR
Areas/operations/activities where there is the potential for foot injury due to lifting or transfer of chemicals, compressed gases, machine and/or equipment parts, and/or use of powered industrial equipment: Gas/Chemical handling Activities, Cleanroom Maintenance Activities, Facilities and Engineering Maintenance Activities, Grounds Keeping Activities, Shipping and Receiving (S&R)									X						
Areas/operations/activities where there is the potential for leg injury due to chemical splashing, flying debris, and/or use of powered industrial equipment: Gas/Chemical handling Activities, Cleanroom Maintenance Activities, Facilities and Engineering Maintenance Activities, Grounds Keeping Activities, construction areas. *NOTE: Apparel needed is long pants.							X*								
Areas/operations/activities where there is the potential for a head injury due to falling objects, such as in construction areas, sub-fab floor in NFN, NFC, & NFX cleanrooms; on loading docks during tool move in; working in a pit or confined space.	X														
Manual handling/storing/receiving/transporting (not for driving fork trucks) of unopened or unused boxes, cases or crates of chemicals or hazardous waste (1 gallon, 5 gallon, or 55 gallon containers)			X						X	X					
Unpacking or opening of boxes, cases or crates.				X											

PERSONAL PROTECTIVE EQUIPMENT (PPE) GUIDELINES FOR SELECTION AREAS/OPERATION ACTIVITIES	HEAD	EAR	GLOVES			APPAREL		SHOES	EYE/FACE			RESPIRATOR			
	HARD HATS	PLUGS/MUFFS	CHEMICAL RESISTANT	TEAR RESISTANT	FLAME/HEAT RETARDANT	COLD RESISTANT	APRONS/SLEEVE APRON/LAB COAT	FLAME RETARDANT COVERALL	STEEL TOE SAFETY SHOES	SAFETY GLASSES	FACESHIELD	FLAME RETARDANT HOOD	N95 Filtering Facepiece	AIR PURIFYING CARTRIDGE (Full facepiece)	SUPPLIED AIR
While handling empty "triple rinsed" chemical bottles, cleaned wet quartz, and any other equipment that has had previous contact with chemicals where the risk of chemical residue is present. This includes, but is not limited to: decontaminating equipment; ductwork; chemical dispense units/cabinets and/or valve manifold boxes. With local exhaust ventilation: Without local exhaust ventilation:			X				X		X	X					
			X				X		X	X				X ^{*1}	
While transferring, pouring, dispensing, mixing, aspirating, or loading or unloading hazardous (health rating of 4) liquid chemicals, or liquid wastes where there exists the potential for skin, eye, and/or respiratory exposure. Tool sets include: photolithography; wet etching; CMP operations; Copper plating operations; stripping, dipping, cleaning of wafers/parts/ equipment. Within glove box or fume hood: With local exhaust: Without local exhaust:			X				X		X						
			X				X								
			X				X				X				X ^{*1}

PERSONAL PROTECTIVE EQUIPMENT (PPE) GUIDELINES FOR SELECTION AREAS/OPERATION ACTIVITIES	HEAD	EAR	GLOVES			APPAREL		SHOES	EYE/FACE			RESPIRATOR			
	HARD HATS	PLUGS/MUFFS	CHEMICAL RESISTANT	TEAR RESISTANT	FLAME/HEAT RETARDANT	COLD RESISTANT	APRONS/SLEEVE APRON/LAB COAT	FLAME RETARDANT COVERALL	STEEL TOE SAFETY SHOES	SAFETY GLASSES	FACESHIELD	FLAME RETARDANT HOOD	N95 Filtering Facepiece	AIR PURIFYING CARTRIDGE (Full facepiece)	SUPPLIED AIR
While transferring, pouring, dispensing, mixing, aspirating, or loading or unloading hazardous (health rating of 3) liquid chemicals, or liquid wastes where there exists the potential for skin, eye, and/or respiratory exposure. Tool sets include: photolithography; wet etching; CMP operations; Copper plating operations; stripping, dipping, cleaning of wafers/parts/ equipment. Within glove box or fume hood: With local exhaust: Without local exhaust:			X				X		X						
			X				X		X					X	
			X				X			X					
While transferring, pouring, dispensing, mixing, aspirating, or loading or unloading non-hazardous (health rating of 2 or less) chemicals, or wastes where there exists the potential for skin, eye, and/or respiratory exposure. Tool sets include: CMP operations and lithography.			X				X		X	X					
While loading, working with, cleaning up, or conducting maintenance in equipment where TMAH (<2.38%) contact or vapors are possible; with local exhaust ventilation. Without local exhaust ventilation: NOTE: PPE MUST still be worn if equipment has been drained and rinsed.			X				X		X	X				X	
			X				X								

PERSONAL PROTECTIVE EQUIPMENT (PPE) GUIDELINES FOR SELECTION AREAS/OPERATION ACTIVITIES	HEAD	EAR	GLOVES			APPAREL		SHOES	EYE/FACE			RESPIRATOR			
	HARD HATS	PLUGS/MUFFS	CHEMICAL RESISTANT	TEAR RESISTANT	FLAME/HEAT RETARDANT	COLD RESISTANT	APRONS/SLEEVE APRON/LAB COAT	FLAME RETARDANT COVERALL	STEEL TOE SAFETY SHOES	SAFETY GLASSES	FACESHIELD	FLAME RETARDANT HOOD	N95 Filtering Facepiece	AIR PURIFYING CARTRIDGE (Full facepiece)	SUPPLIED AIR
While loading, working with, cleaning up, or conducting maintenance in equipment where TMAH (>2.38%) contact or vapors are possible; with splash protection and local exhaust ventilation. Without local exhaust ventilation: NOTE: PPE MUST still be worn if equipment has been drained and rinsed. Full level B chemical resistant suit must be worn.			X				X ^{*7}							X	
			X				X ^{*7}							X	
While working or conducting maintenance on equipment where liquid chemical contact (health rating of *4) or gaseous vapors are possible. PPE MUST still be worn if equipment has been drained and rinsed. With local exhaust ventilation: Without local exhaust ventilation:			X				X			X	X				X ^{*1}
			X				X								X ^{*1}
While working or conducting maintenance on equipment where liquid chemical contact (health rating of 3) or gaseous vapors are possible. PPE MUST still be worn if equipment has been drained and rinsed. With local exhaust ventilation: Without local exhaust ventilation:			X				X			X	X				X ^{*1}
			X				X			X	X				
While working or conducting maintenance on equipment where liquid chemical contact (health rating of 2 or less) or vapors are possible. PPE MUST still be worn if equipment has been drained and rinsed.			X				X			X	X				
Handling broken mercury-filled containers (i.e. thermometers, mercury vapor lamps). Area must be roped off and posted with signage.			X											X	

PERSONAL PROTECTIVE EQUIPMENT (PPE) GUIDELINES FOR SELECTION AREAS/OPERATION ACTIVITIES	HEAD	EAR	GLOVES			APPAREL		SHOES	EYE/FACE			RESPIRATOR			
	HARD HATS	PLUGS/MUFFS	CHEMICAL RESISTANT	TEAR RESISTANT	FLAME/HEAT RETARDANT	COLD RESISTANT	APRONS/SLEEVE APRON/LAB COAT	FLAME RETARDANT COVERALL	STEEL TOE SAFETY SHOES	SAFETY GLASSES	FACESHIELD	FLAME RETARDANT HOOD	N95 Filtering Facepiece	AIR PURIFYING CARTRIDGE (Full facepiece)	SUPPLIED AIR
Performing any work inside a glove bag/glove box while handling nano-sized or ultra-fine particles. NOTE: Double gloves must be worn. With local exhaust ventilation: Without local exhaust ventilation:				X*6X *6			X X			X X			X		
Conducting work/maintenance/cleaning or decontamination of chemical drains, vent lines, scrubbers, or duct work (may require full body suit and supplied air under certain circumstances).			X				X							X	X*1
Opening Valve Manifold Box (VMB), Gas Box, Gas Cabinet, or Gas Interface Box (GIB) door but not breaking a fitting or loading a chemical/gas.										X					
Performing any work inside of a liquid Chemical Dispense Unit (CDU), Liquid Valve Manifold Box (VMB), or T-Box with lines flushed, drained, and front cover ON . Area must be roped off and posted with signage.			X				X			X	X				
Performing any work inside of a liquid Chemical Dispense Unit (CDU), Liquid Valve Manifold Box (VMB), or T-Box with lines flushed, drained, and front cover OFF . Area must be roped off and posted with signage.			X				X							X	
When exercising a manual valve in an exhausted enclosure that has never been exposed to HPMS and introducing HPMS (Highly Toxic Health 3 or 4) for the first time.			X				X								X

PERSONAL PROTECTIVE EQUIPMENT (PPE) GUIDELINES FOR SELECTION AREAS/OPERATION ACTIVITIES	HEAD	EAR	GLOVES			APPAREL		SHOES	EYE/FACE			RESPIRATOR			
	HARD HATS	PLUGS/MUFFS	CHEMICAL RESISTANT	TEAR RESISTANT	FLAME/HEAT RETARDANT	COLD RESISTANT	APRONS/SLEEVE APRON/LAB COAT	FLAME RETARDANT COVERALL	STEEL TOE SAFETY SHOES	SAFETY GLASSES	FACESHIELD	FLAME RETARDANT HOOD	N95 Filtering Facepiece	AIR PURIFYING CARTRIDGE (Full facepiece)	SUPPLIED AIR
Performing maintenance on process gas lines (which breaks the gas line integrity) within a secondary regulator box, Tool Gas Box, VMB, Gas Cabinet, Purifier Cabinet, or GIB (Highly Toxic*4) with local exhaust ventilation. Area must be roped off and posted with signage.			X				X								X
Performing maintenance on process gas lines (which breaks the gas line integrity) within a secondary regulator box, Tool Gas Box, VMB, Gas Cabinet, Purifier Cabinet, or GIB (Corrosive or Toxic*3) with local exhaust ventilation. Area must be roped off and posted with signage.			X				X							X	
Performing maintenance on process gas lines (which breaks the gas line integrity) within a secondary regulator box, Tool Gas Box, VMB, Gas Cabinet, Purifier Cabinet, or GIB (Flammable) with local exhaust ventilation. Area must be roped off and posted with signage.					X			X	X	X					
Performing maintenance on process gas lines (which breaks the gas line integrity) within a secondary regulator box, Tool Gas Box, VMB, Gas Cabinet, Purifier Cabinet, or GIB (Pyrophoric) with local exhaust ventilation. Area must be roped off and posted with signage.		X			X			X				X			X
Use/maintenance of Class 3b and 4 Lasers (safety glasses must be of laser protective type, see Appendix E). See Laser Safety procedure for a list of all engineering and administrative controls that also must be utilized.									X						

PERSONAL PROTECTIVE EQUIPMENT (PPE) GUIDELINES FOR SELECTION AREAS/OPERATION ACTIVITIES	HEAD	EAR	GLOVES			APPAREL		SHOES	EYE/FACE			RESPIRATOR			
	HARD HATS	PLUGS/MUFFS	CHEMICAL RESISTANT	TEAR RESISTANT	FLAME/HEAT RETARDANT	COLD RESISTANT	APRONS/SLEEVE APRON/LAB COAT	FLAME RETARDANT COVERALL	STEEL TOE SAFETY SHOES	SAFETY GLASSES	FACESHIELD	FLAME RETARDANT HOOD	N95 Filtering Facepiece	AIR PURIFYING CARTRIDGE (Full facepiece)	SUPPLIED AIR
Maintenance/cleanouts of tool chambers containing toxic solid materials or harmful dusts such as Arsenic, Boron, Phosphorus, etc. Note: Tyvek suits, hood, and booties should also be worn for such solid contaminated work.			X				X*2							X*1	
Maintenance/cleanouts of tool chambers, vacuum pumps, forelines, or scrubbers containing toxic *3, corrosive, or oxidizing gaseous materials or harmful vapors. Chamber/pump/scrubber/foreline must be cycle purged in accordance with manufacturer's recommendation prior to open.			X				X							X*1	
Maintenance/cleanouts of tool chambers, vacuum pumps, forelines, or scrubbers containing highly toxic *4 gaseous materials or harmful vapors. Chamber/pump/scrubber/foreline must be cycle purged in accordance with manufacturer's recommendation prior to open.			X				X								X*1
Maintenance/cleanouts of tool chambers, vacuum pumps, forelines, or scrubbers containing liquid pyrophoric or water reactive 3 materials. Chamber/pump/scrubber/foreline must be cycle purged in accordance with manufacturer's recommendation prior to open.					X*8			X*9							X*1
Maintenance/cleanouts of reactant tanks or WWT pumps involving potential HF exposure and/or work with other toxics/corrosives (*3)			X				X*2		X*10	X					

Chemical Spill of Unknown Substance														
Gas leak														X
Small chemical spill of unknown substance			X				X						X ^{*1}	
Receiving Compressed Gases, Bubblers or Pre-cursors														
Inert/Non-Toxic/Oxidizer, Corrosive/Flammable/Toxic, Cryogenic liquids/gases									X	X				
Installing or Removing Compressed Gases, Bubblers, or Pre-Cursors														
Inert/Non-Toxic/Oxidizer									X	X				
Corrosive/Toxic ^{*3} /Highly Toxic ^{*4}			X				X		X					X ^{*1}
Flammable (PPE is flame-retardant)					X			X	X	X				X ^{*1}
Pyrophoric/Water Reactive ³ (PPE is flame retardant)		X			X ^{*8}			X ^{*9}	X					X ^{*1}
Cryogenic liquids/gases (Apron should be cryogenic rated)						X	X			X	X			
Connecting liquid nitrogen/cryogenic hoses/lines (Apron should be cryogenic rated)						X	X			X	X			

NOTE: All PPE required for activities associated with emergency response are covered in ERT Organization and Charter Specification **EHS-00019**.

* = Apparel needed is long pants.

*1 = Respiratory protection may not be required or can be downgraded if air monitoring has been performed to prove the effectiveness of the purging procedure or to declassify the inhalation hazard. Respiratory requirements may remain unchanged if the task and/or person performing the task changes or if EHS determine that the risk is unchanged. Please see Respiratory Protection Program, **EHS-00015**, for further information.

*2 = Tyvek suit must be worn with hood and booties.

*3 = NFPA 704 Class 3 HPMS: Toxics and corrosives include: hydrogen fluoride, hydrogen bromide, chlorine, hydrogen chloride, sulfuric acid, particulates, nitrogen trifluoride, ammonia, C5F8/C4F6, sulfur dioxide, sodium hydroxide, boron trifluoride, silicon trifluoride, boron trichloride, silicon trichloride, carbonyl sulfide.

*4 = NFPA 704 Class 4 HPMS: Highly toxics include: arsine, fluorine, diborane, dichlorosilane, germane, phosphine, silane, ozone, carbon monoxide, and nitrogen monoxide.

*5 = Where chemical loading, cylinder changing, maintenance, or cleaning is being performed the area must be roped off and posted with signage.

*6 = Those handling nano-sized or ultra-fine particles should be wearing double gloves during the operation. Use of glove bags or glove boxes for handling are preferred; if not available or cannot be used, P100 cartridge respirator should be worn.

*7 = Chemical resistant Level B suit must be worn to cover head, neck, and back.

*8 = Leather gloves with cotton liner should be worn.

*9 = Leather coat with cotton undergarments or DuPont ThermoPro suit must be worn.

*10 = splash resistant boots.

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